REMARKS

Applicant has cancelled claims 2-3, amended claims 1, 6, 18, 19, 31, 37, 48 and 51-87, and added new claim 88. Thus, claims 1 and 4-88 are currently pending in this application.

In the Office Action, the Examiner rejected claims 6, 18, 19, 31, 58, 59 and 71 under 35 U.S.C. Section 112, second paragraph, as being indefinite. Applicant has made minor changes to all of the objected-to claims to address the Examiner's concerns.

The Examiner also rejected claims 1-87 under 35 U.S.C. Section 103(a) as being obvious over Carlson (US Patent No. 6038023) in view of Trulson (US Patent No. 6252236). Applicant respectfully traverses the rejection.

Claim 1 has been amended to incorporate the language of claim 2 and claim 3. As a result, Applicant has cancelled claims 2-3.

The invention according to claim 1 as amended generally concerns a laser scanning microscope with an ability to track a rapid change of detection bands during scanning of a sample under study. In FIG. 7a, it shows a distribution of different regions of interest (ROI 1-4) of a sample to be scanned. The different regions may respond to different fluorescing dyes whose spectral ranges may overlap with one another. For example, as shown in FIG. 7b, ROI 1 may respond to a dye exhibiting fluorescence spectra 1 (about 380 – 530 nm) and ROI 2 may respond to a dye exhibiting fluorescence spectra 2 (about 480 – 620 nm).

Conventionally, in the case of FIG. 7a, individual dyes are selectively excited and four complete images had to be successively scanned one after the other. Specifically, a reconfiguration of the detection units between the individual ROIs required a physical mechanical movement of the detection components during scanning and was therefore impossible to keep up with the speed in the range of several microseconds that was necessary to quickly compare a plurality of dynamic processes in different regions (ROI's), e.g., with strongly bleaching or moving specimens and fast-running processes.

According to the invention, however, a novel array detector and electronic circuits are used in combination to electronically record and shift the spectral regions of interest during scanning and in one scan. For example, a possible embodiment of the invention is shown in FIG. 6. The construction is essentially a Czerny Turner construction. The first imaging mirror S1 collimates the fluorescent light. Subsequently, the light strikes a line grating G, for example, a grating with a line number of 651 lines per mm. The grating bends the light in

different directions corresponding to its wavelength. The second imaging mirror S2 focuses the individual spectrally split wavelength components on the corresponding channels of the line detector DE, for example, an electron multiplier array by Hamamatsu H7260. The detector has 32 channels and high sensitivity. The free spectral region of the embodiment described above is approximately 350 nm. In this arrangement, the free spectral region is uniformly distributed to the 32 channels of the line detector resulting in an optical resolution of approximately 10 nm. In other words, since the entire spectral range of FIG. 7b is about 350 nm, the detector can simultaneously record fluorescence data of four different dyes in a single scan.

As can be appreciated, a rapid change of the detection bands for multitracking applications, i.e., for a change in the irradiation wavelength or the intensity during the scanning process as is described in DE 19829981A1, is possible with the arrangement according to the invention. The change can be carried out in pixel-exact manner, i.e., within a time period of several μs. Therefore, it is also possible, for example, to take into account determined regions of the specimen to be examined with different detection bands (ROI tracking).

Advantageously, the device according to the invention of claim 1 makes it possible for the user or a computer to quickly rearrange the summing bands between the individual ROIs. The specimen need only be scanned once again to record heavily overlapping ROIs. This is especially important with strongly bleaching preparations.

The adjustment of the ROIs by the user can also take place in the following manner, for example: After the spectral scan is taken using all or most of the excitation lines needed for exciting the dyes in the individual ROIs, sum channels can be formed between the individual excitation laser lines (L1 to L2, L2 to L3, L3 to L4 and L4 according to FIG. 7b up to the maximum emission wavelength). These sum channels correspond to parts of the fluorescence bands of the individual dyes. Further, there is a simultaneous summing of the signals of different dyes in the same sum channels because of the heavy overlapping. These sum channels are subsequently deposited with color-coding in different image channels and are displayed superimposed. Because of the different local color mixes in the image channels, the various ROIs can be localized by the user or by automatic pattern recognition and special summing adjustments can be defined, for example, according to the most frequently occurring colors for the individual ROIs.

The feature described above is recited in claim 1 as "a change in at least one irradiation wavelength and/or irradiation intensity is carried out within a scanning process between different specimen regions and a summing of at least some of the respective spectral components is carried out for different specimen regions and/or irradiation wavelengths/intensities".

The Examiner (in the last paragraph of page 4) stated that the method suggested by Carlson and Trulson suggested a method where "summing of the spectral components is carried out for different specimen regions" by pointing to several sections of Trulson. Applicant respectfully disagrees. In the sections pointed out by the Examiner, Trulson discusses general signal processing of the entire scan data, but the summing of various spectral components are not dependent on "different specimen regions" as recited in claim 1.

For example, in col. 18, lines 43- 58, Trulson teaches that in some cases, the data processing may include subtracting a line of dark data which may have been previously acquired. However, that has nothing to do with summing of selected spectral components. Moreover, the subtraction of dark data does not depend on selected spectral components which depend on different specimen regions. In other words, the signal processing discussed in Trulson is generic and non region-specific and the summing process of the present invention is region-specific.

Similarly, claim 48 also recites "wherein a change in at least one irradiation wavelength and/or irradiation intensity is carried out within a scanning process between different specimen regions and a summing of at least some of the respective spectral components is carried out for different specimen regions and/or irradiation wavelengths/intensities". For the similar reasons as discussed above with respect to claim 1, Applicant submits that claim 48 is also patentable.

New claim 88 is similar to claim 1, except that it additionally recites that the sum signals can be varied during scanning as a function of the excitation parameters (multitracking) or as a function of the respective scanning position (ROI tracking). None of the references teach or suggest such a novel feature as recited.

Dependent claims 4-47 and 49-87 are also patentable by virtue of their dependency from independent claims 1 and 48.

Based upon the above amendments and remarks, Applicant respectfully requests reconsideration of this application and its earlier allowance. Should the Examiner feel that a telephone conference with Applicant's attorney would expedite the prosecution of this application, the Examiner is urged to contact him at the number indicated below.

Respectfully submitted,

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